The Limits of Hearing. J. KERR LOVE. Jour. of Anat. and Physiol., Vol. XXIII, 1889, pp. 336–339.

Love concludes, from experiments made with large tuning-forks and with a series of vibrating metallic tongues, that notes produced by fifteen or sixteen vibrations per second are the lowest which can be heard by the human ear. He describes minutely an instrument of his own device for determining the smallest appreciable difference in pitch. For untrained and slightly trained ears the least observable difference of pitch is from $\frac{1}{3}$ to $\frac{1}{10}$ semitone. A twenty-fourth semitone is a common limit. The ears of such trained musicians as violinists, tuners, and some pianists, can detect with certainty a difference of $\frac{1}{24}$ to $\frac{1}{60}$ semitone. All observers, but especially the untrained, detect sharpened better than flattened intervals. Generally speaking, Weber's law holds good for all but the highest and lowest parts of the musical scale. Love considers Politzer's acoumeter the best test we have for determining the distance at which a note of given intensity can be heard. With this instrument a sound can be heard by normal ears in almost perfect stillness at a distance of 15 or 16 meters. Tone or note-deafness is discussed, and the conclusion is drawn that such cases of deafness (deafness to intervals of a whole tone or more) are very rare, but that some well authenticated instances have been recorded. F. T.

Ueber das Verhalten von Vocalen und Diphthongen in gesprochenen Worten. Untersuchung mit dem Sprachzeichner. WM. MARTENS. Zeitschrift f. Biologie, Bd. XXV, H. 3.

This research is in a sense supplementary to that of Wendeler on the consonants, executed with the same instrument. (See notice of the instrument, AMER. JOUR. PSY. Vol. I, p. 315.) The author had such phrases as *Vater und Mutter, Der Donner rollt, Mein kleines Kind*, etc., spoken into the instrument, and compared the tracings of the vowels with those taken at the same time from a rapid tuning-fork. He found, like Wendeler, very great irregularity in the curves as compared with those of the vowels when sung; indeed, such great irregularity that no detailed results could be reached. The changes of pitch in the same enunciation were apparently without rule as to amount (the largest were an octave or more), direction, rate, or position on the curve. This great variability explains the difficulty of judging the pitch of the vowel tones and of reproducing them artificially. It may be an advantage acoustically, however, for it tends to obscure all tones except the over-tones near to the resonance-tone of the cavity of the mouth, and on these the recognition of the vowel depends. Changes in that cavity itself may also influence the form of the tracing. Experiments with a siren showed that the ear still perceives a *tone* rather than a noise when the pitch of a note is run down through an interval as great as that common in the vowel variations. The speaking voice seemed to be keyed lower than the singing voice, so far as tests could be made. The average length of a vowel tone was 0.182 sec., minimum 0.038, maximum 0.549. In the diphthongs the voice passes from one vowel to the other through a transitional stage that can be seen in the best tracings. When care is not taken in pronunciation the second vowel is apt to be slighted. The article is followed by full numerical tables and a plate giving some of the tracings and also plotted curves for the variations of vowel tones.